NEW SPECIES OF *OSMIA* (HYMENOPTERA: MEGACHILIDAE) FROM THE SOUTHWESTERN UNITED STATES[1,2]

R.W. Rust[3], G.E. Bohart[4]

ABSTRACT: Three new species of the genus *Osmia* (Hymenoptera: Megachilidae) are described and illustrated. They are from the southwestern portion of the United States and are *Osmia neocyanopoda, O. crassa,* and *O. alpestris.*

We describe three new species in the genus *Osmia* (Hymenoptera: Megachilidae) from the southwestern United States. Two, *Osmia neocyanopoda* and *O. crassa,* are from extensive trap nest-reared specimens obtained by Frank D. Parker from the Mojave Desert and the third, *O. alpestris,* is from high montane areas of the Great Basin. The taxonomy presented here is to facilitate the details of species nesting biologies to be presented in anticipated subsequent publications.

MATERIALS AND METHODS

Measurements are based on eyepiece micrometer with 200 divisions for *O. neocyanopoda* and *O. crassa* and 120 divisions for *O. alpestris.* The length of the face is measured from the vertex to the anterior clypeal margin. Lengths and widths of all other structures represent maximums, except that the hind basitarsal width does not include the tooth-like projection, where present, on the inner margin. Greatest interocular distance was measured at the level of the incurve near the upper end of the inner eye margin. Flagellomeres were measured along the midline of the outer face, generally the shortest length.

Holotypes and allotypes will be deposited in the United States National Museum of Natural History, Smithsonian Institution, Washington, D.C. Paratypes will be deposited in the U.S. National Museum; California Academy of Sciences, San Francisco, California; Snow Entomological Museum, University of Kansas, Lawrence, Kansas; and U.S.D.A. Bee Biology and Systematics Laboratory, Logan, Utah.

---

[1]Received September 27, 1985. Accepted April 5, 1986.

[2]Contribution from Utah Agricultural Experiment Station, Utah State University, UMC 48, Logan, UT 84322, Journal Paper No. 3170, and USDA-ARS-Bee Biology and Systematics Laboratory, Utah State University, Logan, UT 84322-5310

[3]Biology Department, University of Nevada, Reno, NV U.S.A. 89557

[4]Federal Collaborator, USDA Bee Biology and Systematics Laboratory, Utah State University, Logan, UT 84322-5310 U.S.A.

Osmia neocyanopoda n. sp.

FEMALE: Length 10 mm, length of forewing 6.4 mm. Coloration: Antennae, mandibles, labrum, trophi, anterior clypeal shelf, tibiae, tarsi, abdominal sterna black to dark brown; remainder of body surface dark (not brilliant) blue. Pubescence: Clypeus, scopa black; frons, vertex, mesonotum, fore femur, tergum I mostly pale but mixed with black; mesepisternum, tibiae, mid, hind femora mostly black with few pale hairs; terga II-V black except some pale hairs along impunctate posterior borders; tergum VI with numerous appressed white hairs mixed with fewer, nearly erect black hairs; parafacial area white; tarsi, hypostomal area brown. Punctuation: Clypeus, frons, vertex, gena, mesothorax with large, nearly contiguous but rather shallow pits; pronotum mostly less than one pit width apart; metepisternum less than one pit width apart except sparse near anterior border; sides of propodeum with large, nearly contiguous but very shallow pits above, grading below spiracle into extremely shallow pits presenting granular appearance; propodeal enclosure with upper half rugostriate, with lower half finely roughened, dull; pits of terga I-III mostly ranging from one to two pit widths apart, those of IV-VI progressively closer (nearly contiguous on VI); apical impunctate tergal borders well defined but short, about three-fourths as long as metanotum. Head: Outer face of mandible with proportions, carinae, toothed apex as in Fig. 1; lengths of labial palpomere I to II 1.1:1.15 mm; both together to length of face 2.25:2.95 mm; clypeus with anterior shelf impunctate, sharply edged, slightly emarginate, about equal in width to distance from anterior margin to upper basal angle of mandible; space between mandibular tufts greater than space occupied by one tuft; greatest to least interocular distance 2.17:1.83 mm. width of face to length 3.38:2.95 mm; flagellomeres I, II subequal in width, much narrower than IV, V; width of gena to eye in lateral view 0.82:0.78 mm. Thorax: Strigilus as in Fig. 2; anterior basitarsus with length to width 0.85:0.25 mm; posterior basitarsus with length to width 1.10:0.37 mm; forewing moderately brownish infumate,. especially along broad apical zone, microtrichia few (about 50 on upper surface of cell first M.). Abdomen: Erect black hairs of terga II-V long, nearly uniform in density, those of VI nearly as long, uniform as on preceding terga but mixed with brown to pale moderately depressed hairs; profile of tergum VI strongly incurved subapically.

MALE: Length 10 mm, length of forewing 8.4 mm. Coloration: Colored as in female but metallic areas somewhat lighter (steel blue instead of dark blue); sterna IV, V without metallic tints. Pubescence: Head, thorax pale, ranging from white on clypeus, mesothorax to yellowish on vertex to pale brown on mandibles, gena next to eye; legs with dark hair (black to brown) mixed with pale hair, terga II-VII with successively greater proportion of black hairs, mostly pale on II, entirely dark on V-VII; longer hairs on sterna I-V black (except hair in median emargination of III; hair of sterna VI, VIII pale; gonocoxites black. Punctation: Pits on frons smaller, with more space between pits than on mesoscutum or vertex but pits less than one pit width apart; sculpturing otherwise as in female. Head: Mandible with apical emargination forming approximate right angle; length of flagellomere I to II to $\overline{XI}$ 0.18:1.25: 0.36 mm; width of cheek to eye in lateral view 0.63:0.84mm; length of flagellum to length of face to width of face 2.86:2.70:3.16 mm; greatest to least interocular distance 1.87:1.57 mm. Thorax: Strigilus as in Fig. 3; fore basitarsus with length to width 0.87:0.18 mm; hind basitarsus with length to width 1.09:0.31 mm with distinct tooth on inner margin two-thirds distance from base to apex; wings as in female but less infumate, with somewhat fewer large microtrichia (about 30-40 on upper surface of cell first M). Abdomen: Tergum VI with shallow median emargination (about twice as wide as deep); tergum VII with median apical projection, projection with emargination wider than deep; sternum I practically truncate medially; sterna II-VI and VIII as in Figs. 4-9; III somewhat thickened, rounded in profile toward apex (not shown in Fig. 5); genital capsule as in Fig. 10.

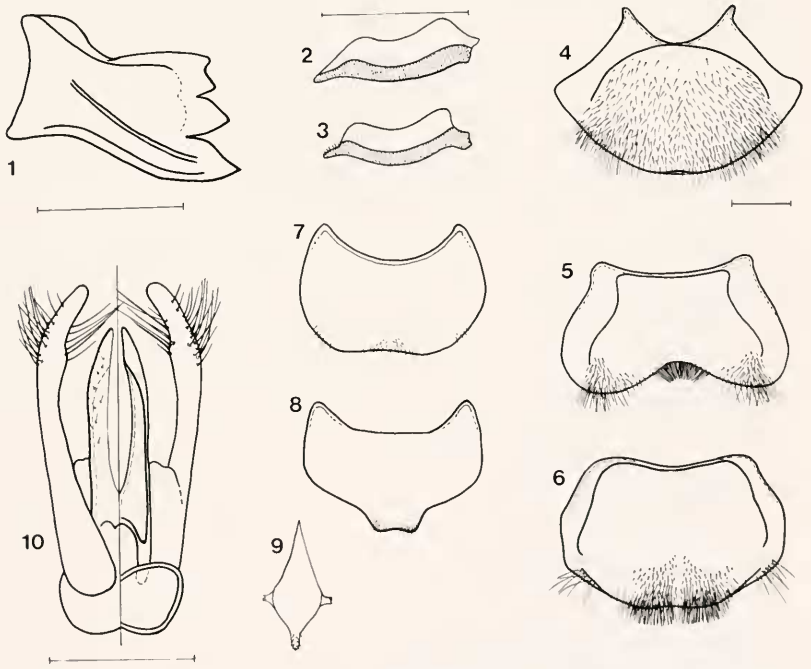
TYPE SERIES: Holotype male: Twelve miles south of Palm Springs, Riverside Co.,

California (F.D. Parker), Rearing No. 16488H. Allotype female: Same data as holotype, Rearing No. 16488B. Paratypes: Six females, 20 males, same data as holotype; 2 females, 1 male 3 miles northwest of Yucca Valley, San Bernardino Co., California (F.D. Parker). 1 male, White Water, Riverside Co., California. All material reared from trap nests by F.D. Parker.

DISCUSSION: The type series is uniform except in size (some specimens are smaller than the holotype and allotype). The species is related to *O. cyanopoda* Ckll. to which it runs in Sandhouse's key to the subgenus *Nothosmia* (1939). It differs in the female by the slightly longer posterior impunctate tergal borders and by the finer sculpturing of the lower half of the sides of the propodeum. It differs in the male by the shallower median emargination of sternum III, the thickened apical area of IV, and the emarginate median lobe of VI filled with dense, pale pubescence instead of short, sparse, black hairs.

The name given to this species refers to its apparent relationship to *O. cyanopoda.*

O. neocyanopoda is placed in the subgenus *Monilosmia.*



Figures 1 to 10 *Osmia neocyanopoda.* Fig. 1 female mandible; Figs. 2, 3 female and male strigilus; Figs. 4 to 9 male sterna II to VI and VIII; Fig. 10 male genitalia. Scale lines are 1.0 mm for mandible, sterna and genitalia and 0.5 mm for strigilus.

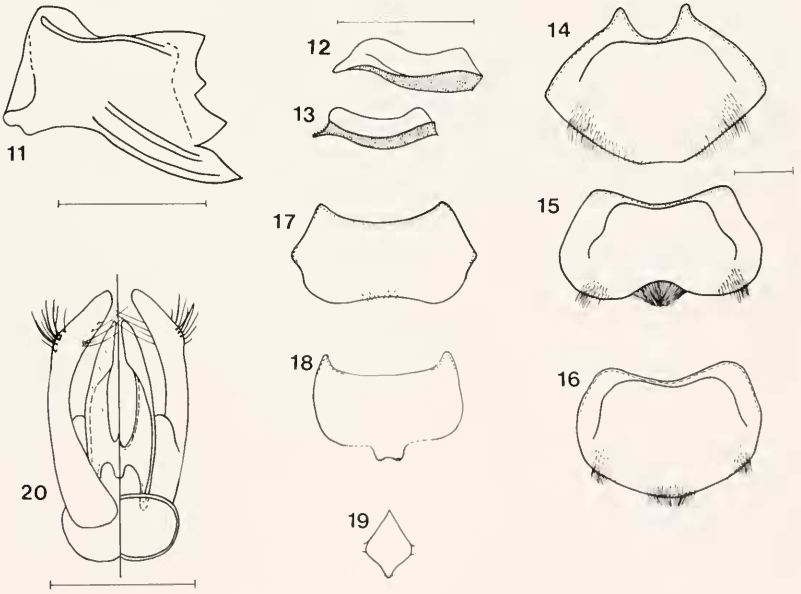
Osmia crassa n. sp.

FEMALE: Length 9 mm, length of forewing 5.7 mm. Coloration: Mandibles, anterior clypeal shelf, antennae, abdominal venter, tarsi black; body otherwise dark blue to greenish blue (but not brilliant). Pubescence: Black or dark coppery, except largely white along inner eye margins, mixed with white on vertex, posterior margin of gena, at least one-half white or silvery on thoracic dorsum, first abdominal tergum reflecting silver in lateral view on most of apical tergum, apices of remaining terga, mesepisternum, along ventral margins of femora; pubescence pale golden to coppery on basitarsi, dark golden to coppery as tufts on mandibular margin. Punctation: Head, thorax, strongly, nearly contiguously pitted, pits slightly larger on mesonotum than on frons or vertex; pits of abdominal terga finer, averaging about one pit width apart, becoming more dense on terga IV, V and VI; posterior impunctate margins of terga very short but well defined, less than half as long as median length of metanotum. Propodeum with upper half finely rugostriate, lower half rather abruptly, finely reticulate, almost polished. Head: Outer face of mandible with proportions, carinae and teeth as in Fig. 11; upper, lower inner mandibular margins without projections; clypeal margin gently rounded, strongly thickened, rounded over apically, its declivity nearly vertical from clypeal face; marginal tufts long, stiff; length of labial palpomere I to II 0.82:1.12 mm; both together compared to length of face 1.95:2.10 mm; hypostomal carina moderately high, reduced well before angle; hypostomal hairs curved inward, forward, especially toward angle of hypostomal carina; width of gena to eye in lateral view 0.82:02.60 mm; greatest to least interocular distance 1.87:1.63 mm; face in anterior view with width to length 2.97:2.70 mm; facial pubescence dense, generally more than half as long as width of eye, denser, strongly proclinate toward clypeal margin which is slightly depressed medially but without transverse depression. Thorax: Strigilus as in Fig. 12; fore basitarsus with length to width 0.79:0.25 mm; hind basitarsus with length to width 1.02:0.36 mm; wings slightly, uniformly yellowed, microtrichia dense, short (100 to 125 on upper surface of cell first M). Abdomen: Pubescence of terga II to V short, nearly vertical, becoming more dense on III-V, that of apical tergum mostly short, prostrate, with few slightly longer more erect black hairs; apical flange of apical tergum nearly horizontal, with well defined sub-basal transverse sulcus.

MALE: Length (abdomen extended) 10 mm; forewing 5.5 mm. Coloration: Integument colored as in female except abdominal sterna I to IV at least faintly metallic blue. Pubescence: White except lightly mixed with dark hairs on ocellar triangle. vertex, mixed with long black hairs on legs (especially anteriorly), replaced by short golden to coppery hairs on tarsi, with largely black hairs on abdomen except mostly white on tergum VI, reflecting silvery on basal portions of sterna III, IV, yellowish near apex of sternum V, dark golden in emargination of sternum III, mostly dark on gonocoxite. Punctation: Pits of head, thorax nearly contiguous, moderately strong, about equal on frons, vertex, mesonotum; abodminal terga pitted as in female; sterna densely pitted on I to IV, very sparsely on V, VI, somewhat sparsely medially on IV. Head: Mandible with angle of emargination between teeth about 60°; flagellomere I length to II to XI as 0.24:0.28:0.33 mm; clypeus nearly obscured by long decumbent hair; greatest to least interocular distance 1.65:1.35 mm; in anterior view width of face to length 2.85:2.55 mm; in lateral view width of gena to eye 0.60:0.70 mm. Thorax: Strigilus as in Fig. 13; fore basitarsus with length to width 0.63:0.19 mm; hind basitarsus with length to width 1.02:0.27 mm, without distinct tooth along inner margin (but with two minute denticles of equal size). Abdomen: Tergum V with very shallow apical median emargination; tergum VI with apical median emargination U-shaped, emargination width greater than depth as 0.15:0.09 mm; sternum I gently emarginate apically; sternum II essentially truncate medioapically, sides of truncation broadly rounded Fig. 14; sterna III-VI and VIII as in Figs. 15-19; genital capsule as in Fig. 20.

TYPE SERIES: Holotype female: one mile west Yucca Valley, San Bernadino Co., California (F.D. Parker), Rearing No. 14728A. Allotype male: same data as holotype, Rearing No. 14728D. Paratypes: Five females, seven males same data as holotype; 27 females, 12 males Joshua Tree, San Bernardino Co., California (F.D. Parker); two females five miles West Krammer Junction, San Bernadino Co., California (F.D. Parker); two females 11 miles northeast Big Pine, Inyo Co., California (F.D. Parker): one female, one male, one mile south Morango Valley, San Berandino Co., California (F.D. Parker); two females, four males 25 miles south Jacob Lake, Coconino Co., Arizona (F.D. Parker); and one female, one male, 30 miles east Baker, Nevada (F.D. Parker). All type materials reared from trap nests by F.D. Parker.

ADDITIONAL SPECIMENS: UTAH: five females, one male, four air miles north Gilson, Emery Co., May 7, 1981, on *Cryptantha flava*; two females, 35 miles southwest Park Valley, Box Elder Co., June 24, 1973 (P.F. Torchio); one female, Cornish, Cache Co., June 15, 1959; one female, five miles east, dunes, Lynndyle, Millard Co., June 20, 1963 (G.E. Bohart) on *Amsinckia*; one female, Avon, Cache Co., June 25, 1959, on *Medicago sativa*; one female, Jericho, Juab Co., June 2, 1959, on *Astragalus lentiginosus*; two females, Leeds, Washington Co., May 4, 1963 (G. Bohart & R. Brumley) on Cruciferae; NEVADA: two females, Winnemucca, Humboldt Co., June 8, 9, 1961 (G.E. Bohart) on *Gilia, Oenothera*; one female, 10 miles north Gabbs, Nye Co., June 13, 1972 (P.F. Torchio) on *Melitotus*; CALIFORNIA: three females, Westgard Pass Plateau, Inyo Co., May 27-June 3, 1937 (E.C. Van Dyke); MEXICO: one female, 0.5 miles east Hamilton Ranch Airfield, Baja California Norte, April 28, 1963 (H.B. Leech, P.H. Arnaud).



Figures 11 to 20 *Osmia crassa*. Fig. 11 female mandible; Figs. 12, 13 female and male strigilus; Figs. 14 to 19 male sterna II to VI and VIII; Fig. 20 male genitalia. Scale lines are 1.0 mm for mandible, sterna and genitalia and 0.5 mm for strigilus.

DISCUSSION: The type series is quite uniform but specimens from Utah and Nevada have less pale hair in the female and little, if any, silvery reflection from pubescence on the apical tergum. Specimens from Arizona are nearly as black-haired as those from Utah and Nevada but have at least a small patch of silvery reflecting pubescence on the apical tergum.

The species is related to *O. rawlinsi* Sandhouse and keys to the same couplet with *O. rawlinsi* and *O. indeprensa* Sandhouse (Sandhouse 1939). Both sexes can be distinguished from the former by smaller size, sparser pubescence under labial palpomere I and, in the female, by the form of the thrid apical mandibular tooth, which is more prominent and centrally located. It can be distinguished from both sexes of *O. indeprensa* by its relatively dull metallic color and, in the female, by the bridge between the third and fourth tooth.

This species is named for the greatly thickened anterior margin of its clypeus.

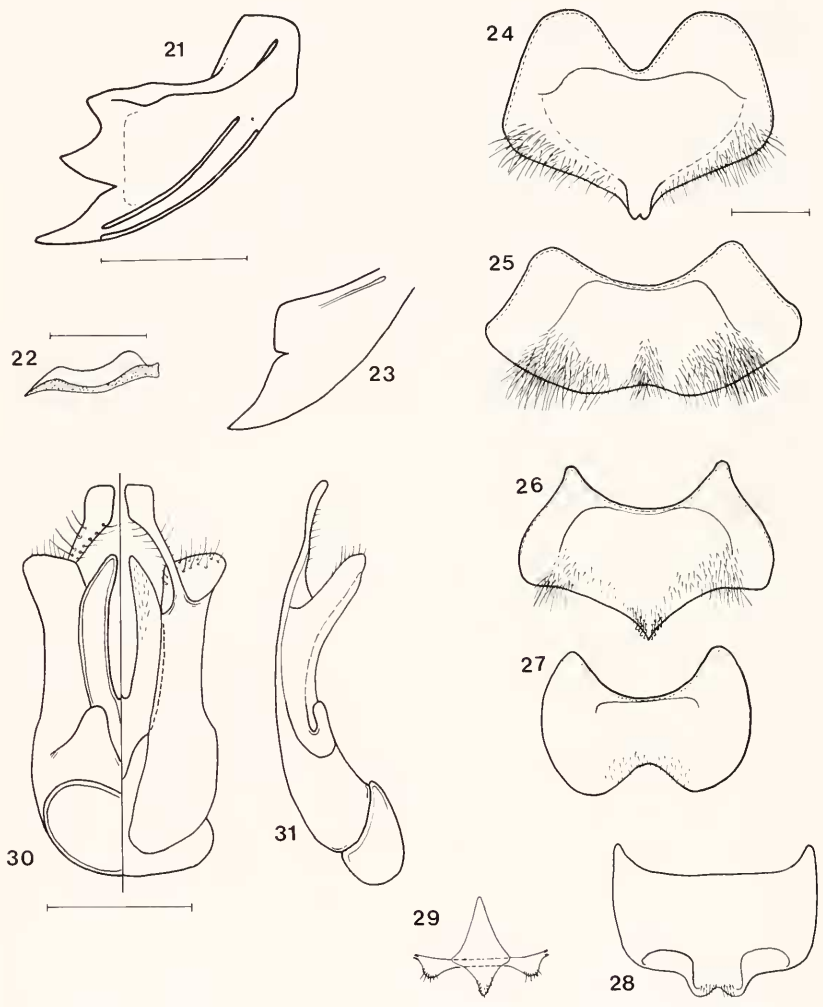
O. crassa is placed in the subgenus *Monilosmia.*

Osmia alpestris n. sp.

FEMALE: Length 9 mm, length of forewing 7 mm. Coloration: Antennae, mandibles, labrum, trophi, anterio-medial clypeal edge, legs, tegulae, abdominal sterna black; tarsal claws red brown; abdominal terga green-black; remainder of body surfaces greenish to greenish black. Pubescence: Clypeus, paraocular, gena, hypostomal area, episternum, metepisternum, propodeum, coxae, trochanters, femora, abdominal terga II to VI and scopa with black hairs; episternal hairs finer and longer; tergum VI with dense appressed blackish hairs; mandibles with orangish-brown and black hairs, black much longer; tarsi with orangish-brown hairs, fore basitarsus with long pale hairs; supraclypeal, supra-antennal, vertex, pronotum, scutum, scutellus, abdominal tergum 1 with pale and black hairs intermixed; apical edge of femora, tibiae with short white fringe hairs. Punctation: Head with fine, contiguous punctures; thoracic punctures slightly larger, contiguous except medioposterior scutum with shining spaces between punctures, metanotal punctures separated by one width, dorasal one-half of propodeal traingle minutely punctate, ventrally impunctate, propodeal pit large, oval, impunctate; abdominal terga I to V with fine punctures, separated by 2 to 3 widths, apical impunctate bands wide, one-fourth as wide as punctate area, finely tesselate, tergum VI with larger almost contiguous punctures. Head: Length of face 3.0 mm, width of face 3.25 mm, mandible with three teeth, upper shortest, upper tooth lower margin shorter than upper margin of middle tooth as 0.25:0.30 mm, lower tooth upper margin longer than lower margin of middle tooth as 0.47:0.30 mm, apical width 2.0 X narrowest medial width or 0.75:0.37 mm, uppermost mandibular carina weak, ending before apical impunctate area, middle and lower carinae parallel, subequal in thickness (Fig. 21), inner ventral margin without tooth; stipes with posterior patch of long, black hairs, maxillary palpomeres as 0.12:0.17.07:0.05 mm; labial palmpomeres I and II as 1.1:1.3 mm; apical clypeal margin impunctate, shorter than lateral margin as 0.67:0.82 mm; clypeus convex medially; flagellomere I half width of X, I twice as long as II; hypostomal carina slightly raised behind angle, reduced at angle; maximum eye to gena width (one view) as 0.62:0.87 mm; lateral ocellus closer to vertex than to compound eye as 0.47:0.60 mm. Thorax: Wings clear, apically beyond cells lightly infumate, wing veins black to brown-black, posterior wing cells with moderately dense black microtrichia, apically with denser, shorter hairs; stridulus as in Fig. 22; fore basitarsus with length to

width as 1.0:0.25 mm; hind basitarsus with length to width as 1.5:0.45 mm; inner hind tibial spur straight, long as 1.12:1.5 mm to basitarsal length. Abdomen: Impunctate flange on tergum VI not preceded by sulcus.

MALE: Length 10 mm, length of forewing 7.3 mm. Coloration: Head, thorax and abdominal terga olive-green; mandibles, scape, pedicel, coxae, trochanters, femora, tibiae, basitarsae black; flagellum, tarsal segments II to IV red-brown to black; tarsal segment V red brown. Pubescence: Head, except central genal area, thorax except propodeum, abdominal terga I, II, fore femur, tibia, basitarsus, mesotibia, basitarsus, meta tibia with long pale hairs, bases often tinged yellowish; abdominal terga III to V with intermixed pale and black hairs; central genal area, lower one-half propodeum, meso-, metafemora with black hairs; abdominal tergum VI with dense, long (1.0 mm) mixed pale and black hairs; hind basitarsus with dense, long (1.0 mm) mixed pale and black hairs; hind basitarsus with orange-brown hairs. Punctation: Head with small, contiguous punctures, clypeal punctures finer (hair must be removed); thorax with punctures slightly larger, contiguous, pronotum becoming weakly tesselate apico-laterally, lower two-thirds of metepisternum impunctate, metanotum densely rugose, dorsal one-half propodeal triangle finely rugose, lower one-half impunctate; abdomninal terga I to III with fine punctures separated by 2 to 3 widths, terga IV to VI with punctures becoming denser, those of tergum VII even denser. Head: Length of face 3.0 mm, width of face 3.6 mm; mandible with upper apical angle oblique, lower tooth triangular, apex acute, apical width 2 X narrowest median width (Fig. 23); maxillary palpomeres as 0.12:0.27:0.15:0.07 mm; labial palpomeres I to II as 1.25:1.5 mm; scape width to length 0.37:0.85 mm, lateral ocellus closer to vertex than to compound eye as 0.37:0.55 mm; hypostomal carina low, reduced at angle, gena to compound eye width (one view) as 0.62:0.95 mm. Thorax: Forewing clear, posterior cells with sparse microtrichia, submarginal cell 2 apically with microtrichia somewhat denser; fore basitarsus length to width as 0.30:0.87 mm, segments II to IV with expanded anterior and posterior lobes, larger than fore mediotarsal lobes, segment V enlarged; hind femur length to width as 2.3:1.0 mm, dorsal margin convex, apical ventral impunctate concavity; hind tibia with ventral surface concave, concavity filled with short, dense white hairs, dorsal surface convex; hind basitarsus with length to width as 1.4:0.57 mm, greatest width subapically, apical margin rounded, segments II to V not modified. Abdomen: Terga I to V with side apical impunctate bands; tergum VI with apical margin produced, smooth, no median emargination; tergum VII with median apical emargination V-shaped, width of emargination greater than length of side as 0.22:0.3 mm; sternum I with median apical bifid, ventral projection; sternum II with median apical lobe, ventrally projecting, median impunctate strip proceeding from projection to posterior margin, strip laterally bounded by slightly elevated areas (Fig. 24), lateral apical patch of long, straight, black hairs, medially and posteriorly hairs reduced; sternum III with slight median apical emargination, margin only slightly produced laterally (Fig. 25), median apical patch of dense, pale hairs, apically slightly extended laterally and merging with lateral patch of long, straight, black hairs; sternum IV with apical margin acutely triangular, lateral apical patch of dense, hooked, black hairs separated medially by narrow impunctate area (Fig. 26), apical lateral corner with patch of long, dense, straight black hairs, two patches separated by apical impunctate area, posteriorly merging with much shorter, straight, black hairs; sternum V with wide, apical emargination, emargination width to depth as 1.3:0.12 mm, emargination width to apical width as 1.3:2.75 mm, emargination area with short, fine pale hairs, hairs not filling emargination (Fig. 27); sternum VI with median apical produced portion cordate, laterally with slightly elevated ridges, medial area with short, dense, pale hairs (hairs bounded laterally by elevated ridges) (Fig. 28), lateral apical margin subtruncate, clear; sterna VII and VIII as in Fig. 29; genitalia as in Figs. 30, 31; gonocoxite with subapical margin (margin below gonocoxite process) truncate, apical dorsal surface with pale (golden) hairs; gonocoxite process slender, apically expanded, apical margin subtruncate, ventral surface of process with pale hairs; penis value with short, pale hairs on dorsal surface; volsella with apical margin rounded.



Figures 21 to 31 *Osmia alpestris.* Fig. 21 female mandible; Fig. 22 female strigilis; Fig. 23 male mandible; Figs. 24 to 29 male sterna II to VIII; Figs. 30, 31 male genitalia. Scale lines are 1.0 mm for mandibles, sterna and genitalia, and 0.5 mm for strigilus.

TYPE SERIES: Holotype male: Nevada, White Pine Co., Wheeler Peak Camp Ground, June 9, 1979 (R.W. Rust). Allotype female: same data as holotype with male mounted on top, pair taken *in copula.* Paratypes: 16 males, same data as holotype; eight males, seven females Nevada, White Pine Co., Mt. Moriah, June 12, 1979 (R.W. Rust.)

ADDITIONAL SPECIMENS: UTAH: One male and two females, Cedar Breaks, Iron Co., June 22, 1978 (G.A. Levin); one male, Richfield, Sevier Co., 14 June 1964 (R.W. Rust); one male, Beaver-Junction Summit, Piute Co., 23 June 1971 (G. Bohart & P. Torchio).

DISCUSSION: Little variation exists in the type series and additional specimens. Males will key to *Osmia lanei* Sandhouse and *O. giffardi* Sandhouse in White (1952) but are easily separated from them by the bidentate projection of sternum I, the weak furrow but well developed ventrally protruding apical projection of sternum II, the triangular apex of sternum IV with its apical patches of hooded bristles separating a narrow oval impunctate area and the cordate process of sternum VI. Females run to *Osmia physariae* Ckll. (White 1952) and may be separated from it by the contiguous punctures of the episternum; in *O. physariae,* the posterior portion has shiny interspaces between the pits. *Osmia alpestris* is slightly larger than *O. physariae* (8 to 9 mm compared to 7 to 8 mm). It is also close to *O. nifoata* Ckll., which has thickened hind tibial spurs, and to *O. giffardi*, which has a heavy subapical fringe of white hairs basad of the apical impunctate tergal bands.

This species was named for its geographical location, the high mountains of the Great Basin of North America.

O. alpestris is placed in the subgenus *Acanthosmioides.*

ACKNOWLEDGMENTS

We would like to thank T.L. Griswold and F.D. Parker, U.S.D.A. Bee Biology and Systematics Laboratory, Logan, UT for reviewing the manuscript.

LITERATURE CITED

Sandhouse, G.A. 1939. The North American bees of the genus *Osmia* (Hymenoptera: Apoidea). Entomol. Soc. Washington Memoirs 1:1-167.

White, J.R. 1952. A revision of the genus *Osmia,* subgenera *Acanthosmioides* (Hymenoptera, Megachilidae). Univ. Kansas Sci. Bull. 35: 219-307.